


**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. PCT/GB2004/002912	International filing date (day/month/year) 02.07.2004	Priority date (day/month/year) 02.07.2003	
International Patent Classification (IPC) or national classification and IPC G06F9/46, G06F1/32			
Applicant SYMBIAN SOFTWARE LIMITED			
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p style="margin-left: 20px;">a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 4 sheets, as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p style="margin-left: 20px;">b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>			
<p>4. This report contains indications relating to the following items:</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. II Priority</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p style="margin-left: 20px;"><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. VI Certain documents cited</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p style="margin-left: 20px;"><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>			
Date of submission of the demand  29.04.2005		Date of completion of this report  27.10.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016		Authorized Officer  Kusnierczak, P  Telephone No. +31 70 340-3572	



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/GB2004/002912

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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1, 2, 5, 6	as originally filed
3, 4	filed with telefax on 01.05.2005

**Claims, Numbers**

1-14	filed with telefax on 01.05.2005
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**Drawings, Sheets**

1/1	as originally filed
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- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
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International application No.  
PCT/GB2004/002912

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-14
	No: Claims	
Inventive step (IS)	Yes: Claims	1-14
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-14
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

1 Reference is made to the following documents:

D1: HASSLER V ET AL: "Controlling applets' behavior in a browser" COMPUTER SECURITY APPLICATIONS CONFERENCE, 1998. PROCEEDINGS. 14TH ANNUAL PHOENIX, AZ, USA 7-11 DEC. 1998, LOS ALAMITOS, CA, USA, IEEE COMPUT. SOC, US, 7 December 1998 (1998-12-07), pages 120-125, XP010318612 ISBN: 0-8186-8789-4

D3: EP-A-0 942 368 (LUCENT TECHNOLOGIES INC) 15 September 1999 (1999-09-15)

2 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of **claims 1-14** does not involve an inventive step in the sense of Article 33(3) PCT.

2.1 The document D3 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses (the references in parentheses applying to this document):

a method of enabling a multitasking computing device to preserve system resources (col 3, line 57 - col 4, line 9, comprising the steps of  
(a) determining if an application is in the background or foreground (col 8, lines 20-31),

from which the subject-matter of claim 1 differs in that it defines an application which is untrusted and suspending the running of the untrusted application while the application is in the background but allowing the untrusted application to run again once in the foreground.

The feature of determining whether an application is trusted or untrusted is a well-known design option for the person skilled in the art, see for instance document D1 (page 120, right-hand column, lines 30-38).

Moreover, the feature of transition from one execution state to another execution state of a task is known from document D3 (col 9, lines 3-8; col 10, lines 10-20).

Furthermore, the feature of suspending the running of an application while the application is in the background but allowing the application to run again once in the foreground is a well-known design option, which fully corresponds to the interrupt mechanism suspending the execution of a "background" task, and initiating the execution of a "foreground" task, upon occurrence of an interrupt and resuming the execution of the background task after handling said interrupt.

The crucial feature of claim 1 is to suspend an untrusted application only when it is in the background. The skilled person, taking into consideration the teaching of the document D3 and the above optional features would easily come to the conclusion that in order to suspend one particular application he needs to make two verifications:

1. to verify whether the application is untrusted;
2. to verify whether the application is running as a background task.

These two forms of verification are well-known design options, as indicated above, and using them together, as an extra check for ensuring that the right application is going to be suspended, does not bring any new surprising effect.

Therefore, the skilled person would effortlessly apply the above optional features to the teaching of the document D3 and in so doing, he would arrive, without exercising any inventive effort, at the subject-matter of claim 1.

Thus, the subject-matter of claim 1 does not involve an inventive step in the sense of Article 33(3) PCT.

- 2.2 The same reasoning applies, *mutatis mutandis*, to the subject-matter of the corresponding independent claims 12 and 14, which therefore are also considered not inventive.
- 2.3 The additional features of dependent **claims 2-11 and 13** are, insofar as not known from the obvious combination of documents D1 and D3 (see passages cited in the

**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

PCT/GB2004/002912

International Search Report), routine measures normally to be expected by the person skilled in the art, and are therefore not inventive.

## SUMMARY OF THE INVENTION

In a first aspect of the present invention, a method of enabling a multitasking computing device to preserve system resources comprises the steps of (a) determining if an  
5 untrusted application is in the background or foreground and (b) suspending the running of an untrusted application while that application is in the background but allowing the untrusted application to run again once in the foreground.

It is valuable to preserve system resources (CPU, power) in multitasking computing  
10 devices: For mains powered desktop computers, the fact that applications can run in the background and hence still consume some system resource is a waste of CPU and scheduler activity. And in the battery operated, portable device domain, it is especially valuable to conserve system resources wherever possible since doing so can increase battery life, as noted earlier.

15 A device implementing the present invention preserves system resources by denying system resources and services to background applications that do not meet predefined 'trust' or certification criteria – i.e. criteria which define the level of trustworthiness of the application. There are various criteria that may be relevant in assessing whether a give  
20 application is 'untrusted' or not; these include, without limitation:

(a) which protected resources on the device can be accessed by the application: an 'untrusted' application might be defined as one that is not able to access certain predefined protected resources; or

(b) whether the application was loaded from ROM or RAM: applications  
25 loaded from RAM are likely to be from third party sources and hence less trustworthy than applications loaded from ROM, which would typically be provided by the device manufacturer; or

(c) whether the application has been validated using some predefined  
30 validation or certification process.

Applications might, in theory, be written so that they take notice of an event sent to them when they are sent to background, causing them to automatically cease running. But even this is likely to be missed in applications which are from certain kinds of third party programmers or are not validated as proper implementations – i.e. 'untrusted'

applications. 'Untrusted' applications are therefore more likely to contain a wrong implementation of normal background behaviour: hence, merely relying on an application to voluntarily cease running when notified that it is in the background is an inadequate strategy for untrusted applications. Instead, they need to be actively prevented from running.

With the present invention, untrusted third party applications (such as downloaded applications like games) are prevented from running in the background and are suspended. Trusted applications may still be allowed to run in the background, or they may be actively prevented in the same way as non-trusted applications, or they may be requested (but not prevented) to stop running if in background. Trust will conventionally be established for a given application using a signature in the application installation file, although there are other techniques that may be deployed as part of the secure computing base of the device.

In a second aspect, there is a multitasking computing device programmed to be capable of (a) determining if an untrusted application is in the background or foreground and (b) suspending the running of an untrusted application while that application is in the background but allowing the untrusted application to run again once in the foreground, in order to conserve system resources. The device may be battery powered.

In a third aspect, there is an operating system for a multitasking computing device, the operating system being capable of (a) determining if an untrusted application is in the background or foreground and (b) suspending the running of an untrusted application while that application is in the background but allowing the untrusted application to run again once in the foreground.

#### BRIEF DESCRIPTION OF THE DRAWING

The invention will be described with reference to the accompanying drawing, which is a schematic of some of the components of a device in accordance with the present invention.



## CLAIMS

1. A method of enabling a multitasking computing device to preserve system resources, comprising the steps of (a) determining if an untrusted application is in the background or foreground and (b) suspending the running of an untrusted application while that application is in the background but allowing the untrusted application to run again once in the foreground.  
5
2. The method of Claim 1 in which a window server component determines if the untrusted application is in the background or foreground.  
10
3. The method of Claim 2 in which, for an untrusted application in the background, the window server sends a control signal to a scheduler or interrupt handler to prevent the application from running.  
15
4. The method of Claim 1 comprising the further step of preventing an untrusted background application from 'polling' for data over a wireless network.
5. The method of Claim 1 comprising the further step of preventing an untrusted background application from running if a display shows a screen saver or is turned off.  
20
6. The method of Claim 1 in which a trusted application in the background is (i) still allowed to run, or (ii) actively prevented from running or (iii) requested to stop running.
- 25 7. The method of Claim 1 in which an application has been deemed to be untrusted by the device assessing:
  - (a) which protected resources on the device can be accessed by the application; or
  - (b) whether the application was loaded from ROM or RAM; or
  - (c) whether the application has been validated using some predefined validation or certification process.  
30
8. The method of Claim 7 in which a background application is prevented from running only if it does not meet predefined 'trust' or certification criteria established using a signature in an installation file for the application.

9. The method of Claim 1 in which the device is battery powered.

10. The method of Claim 1 in which the system resources that are preserved are one  
5 or more of (i) power, (ii) CPU activity and (iii) scheduler activity.

11. The method of Claim 1 in which the device is powered by a UPS (uninterruptible power supply).

10 12. A multitasking computing device programmed to be capable of (a) determining if an untrusted application is in the background or foreground and (b) suspending the running of an untrusted application while that application is in the background but allowing the untrusted application to run again once in the foreground.

15 13. The device of Claim 11 which is battery powered.

14. An operating system for a multitasking computing device, the operating system being capable of (a) determining if an untrusted application is in the background or foreground and (b) suspending the running of an untrusted application while that  
20 application is in the background but allowing the untrusted application to run again once in the foreground.

25

10/562326  
IAP17 Rec'd PCT/PTO 23 DEC 2005

IPEA  
EPO  
D-80298 Munich  
Germany

31<sup>st</sup> April 2005

Dear Sirs

**PCT/GB2004/002912**  
**Our ref: App Suspend (PCT)**

Thank you for the Written Opinion of the ISA.

The Written Opinion cites 2 category Y documents against the independent claims:

- D1** Hassler "Controlling applets' behaviour in a browser"
- D2** RWsSession in Window Server" Symbian

In light of the citations, the applicant files replacement pages as follows:

Replacement pages 3, 4, 7, 8 to replace the same pages as originally filed

Triplicate copies will follow by post, together with one set marked to show all changes.

Amended Claim 1 now reads:

1. A method of enabling a multitasking computing device to preserve system resources, comprising the steps of (a) determining if an untrusted application is in the background or foreground and (b) **suspending the running of an untrusted application while that application is in the background but allowing the untrusted application to run again once in the foreground.**

The new text is shown highlighted. Support can be found at

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“With the present invention, untrusted third party applications (such as downloaded applications like games) are prevented from running in the background and are suspended.” Page 4 lines 5 – 8. And also at:

“When the untrusted application is brought to the foreground again, it is allowed to run again.” Page 5 lines 24 - 25

This differs over D1 because nowhere does D1 disclose or suggest suspending an applet whilst that applet is in the background but unsuspending it if in the foreground (an example of malicious applets in the foreground could be the advertisement applets “that constantly appear on a web site” mentioned in the abstract to D1). The objective of D1 is to restrict the effects of a malicious applet; it would be illogical to adapt D1 so that a malicious applet was given full system resource access when in foreground.

In the light of the above amendments and arguments, re-consideration of the present application is requested. Should the examiner require further clarification, a further Written Opinion is requested.

Yours faithfully,

Peter Langley

10/562326

IAP17 Rec'd PCT/PTO 23 DEC 2005

IPEA  
EPO  
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16 August 2005

Dear Sirs

**PCT/GB2004/002912**  
**Our ref: App Suspend (PCT)**

Thank you for the second Written Opinion of the ISA.

**Novelty/inventive step**

The examiner puts forward an obviousness argument based on two further items of prior art:

**D3 (Lucent):** this describes how both background and foreground tasks can be analysed; if all tasks, *irrespective of whether they are in the background or foreground* are inactive, then a power saving mode can be entered. **D3** however has no bearing on denying system resources to an *untrusted* application. **D3** was classified as category A in the ISR.

**Standard interrupt function:** a background task is suspended and a foreground task initiated when some event occurs. Like **D3**, this has no direct bearing on denying system resources to an *untrusted* application.

The only prior art relevant to the idea of denying system resources to an *untrusted* application is the originally cited **D1**. Whilst **D1** describes stopping or suspending applets if they behave suspiciously, this is done *irrespective* of whether a misbehaving applet is in the background or foreground. The essence of the present invention is that an untrusted

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application is suspended *only* when it is in background. But **D1** explicitly *teaches away* from acting against an applet *only* when it is in the background. Further, this is just like **D3**, which *also explicitly teaches away* from acting against a task *only* when it is in the background.

Because of this, even if **D1** could be combined with **D3** or the standard interrupt function, the result would still be a system that stops or suspends applets if they behave suspiciously, *irrespective* of whether that untrusted applet is in the background or foreground.

Whilst the skilled person could realise that the prior art can be modified to arrive at a system in which untrusted applications are suspended *only whilst in background*, it cannot be said that the skilled person *would as a matter of course* do so. In fact, the likelihood of this seems small given the explicit contract teachings in **D1** and **D3**.

Yours faithfully,

Peter Langley